OBSERVATION OF THE FORMATION OF SUGAR CRYSTALS IN THE JUICE OF SORGHUM SACCHARATUM.

BY E. B. COWGILL.

In effecting the crystallization of sugar from the juice of sorghum *saccharatum* I observed carefully, with the aid of a lens, the several stages of the process.

The juice was first defecated by the usual lime process, and then reduced to a density, while hot, of 20° B. A portion of this liquid was introduced into a small experimental vacuum-pan. The vacuum was maintained at about 24 inches mercury by a spray of water in a receiver, and by hand pumping. Heat of a coal fire was applied through a water bath. The temperature remained at about 140° F. Opportunity was not available, except as hereafter noted, for determining the specific gravity of the syrup at the time crystallization commenced, but the sugar-boilers' usual test of drawing samples of the hot syrup between the thumb and fingers was made repeatedly. When the fibers thus drawn reached a length of about two and a half inches the syrup showed under the microscope a slight turbidity or cloudiness, somewhat resembling the effect produced by allowing a few drops of milk to fall into a glass of water. Examination by transmitted light showed the particles of the little cloud to be crystals, able to refract and reflect light. These crystals were so minute that no forms could be described, nor could they be discovered to have appreciable size; and only by their action upon light, which from its delicacy might easily have escaped observation, could the beginning of the crystallization be detected. Another phenomenon which usually precedes crystallization, and is often seen after the formation of microscopic crystals has taken place, may be easily confounded with crystallization: When a sample is removed from the vacuum-pan and placed upon glass for observation, the surface becomes cooled and somewhat rigid. As the reduction of temperature reaches the interior portions, contraction ensues, and with it minute flexures of the already cooled surface. These flexures refract and reflect light strongly, and these effects are liable to be mistaken for or to overshadow the less prominent but more beautiful effects of the crystals. A more unpardonable error is to mistake for crystals the curious-looking gaseous bubbles of various sizes which precede crystallization and sometimes continue long after the appearance of the cloud of microscopic crystals.

To increase the size of the infant crystals it is only necessary to "feed" them. Having continued the concentration of the syrup, in vacuo, until, by the thumb-and-finger test, fibers may be drawn four or five inches long, a small portion of fresh semi-syrup was added. No new crystals appeared to be formed from this fresh addition, but a portion of the sugar it contained seemed to gravitate to the microscopic crystals of the first portion. The growth, however, was so inconsiderable that only after several successive additions could the crystals be seen to have either size or form. The action upon light, however, became more distinct at each addition. What at first might have been confused with the refraction and reflection of the crumpled surface, or even with the shimmer of a liquid surface, was discernible even by unpracticed eyes as the true crystalline refraction and reflection. After a few more additions the clouded appearance was lost. Now a sample viewed through the lens by reflected light appeared like a miniature bank of fine, yellowish sand; the forms of crystals were distinct as they lay piled one upon another in the syrup. So greatly was I elated at this stage of my first experiment that the thermometer was neglected, and before it was suspected the temperature had risen to 160° F., and the crystals all disappeared. To renew them and again build them up to their former size was a work of several hours. This being done, the process of feeding

by fresh additions of syrup was continued until the crystals presented the diverse forms, from solid-looking truncated cubes to long, slender prisms which characterize cane sugar. But now the microscope was no longer needed, and the growth was so rapid that each successive addition of syrup seemed to produce an appreciable enlargement of the crystals.

NOTE ON A HABIT OF THE RED ANTS.

BY ROBERT HAY, JUNCTION CITY.

Two years ago Professor Snow and Mr. Savage directed the attention of the Academy to the fact that the red ant of the plains covered his large hills with glittering fragments of quartz, feldspar, and other bright minerals. Glass beads were also mentioned as occurring, and a general conclusion was arrived at that this bright material was not brought from underground, but gathered around the hill and used probably with reference either to the reflecting or radiating power of the polished surfaces on the solar heat. Since then the writer has had abundant opportunity of verifying the conclusion that the ants collected the material around and not within their mounds.

Early in the recent summer the writer saw a paragraph copied in another southwestern paper from the Dodge City *Times*, in which it was said that the ant-hills in that region indicated the presence of coal beneath the surface, as the red ants brought up fragments of it and placed it on their mounds. In the month of July we found that quite a number of persons at Dodge City had this idea. A talk we had with Editor Klaine (which he published) served to dispel this fond illusion, but it was interesting to observe the fact on which it had rested. In a walk of about seven miles easterly along the railway track from Dodge City, we observed about fifty ant-hills, and about half of them had fragments — bright, shining cubes — of coal among the quartz with which the hills were mostly covered. In Dodge City itself, on the rising ground north and for miles along the wagon road west, we found coal among the coverings of many of the ant-hills. The cause of this was not far to seek. It was very interesting to note that on the railway track a hill would be remarkable for the quantity of coal upon it, while another hill not twenty feet away had not a single black particle on it. Those having the coal were in the ditch close to the track, or on the prairie adjoining not elevated above the track, and there were always pieces of bright Trinidad coal breaking up by weathering, lying near, which had been dropped from some passing train. The hills without coal were upon high banks where such droppings were not available; or if lower, where no droppings of coal had taken place. It was the same wherever we found coal — some house was near where it had been used, or some roadway along which it had been hauled.

We have noticed further, that the ants will use other material. On the great gravel deposits of Colorado the quartz and feldspar are the prevalent coverings for these hills, but a few miles from Pueblo there are spots where the gravel has all disappeared, though it is found again only a few rods off. In some of these spots on cretaceous shale we found the mounds of the red ants without one speck of quartz, but covered entirely with thin, lenticular fragments of hematite, or limonite, from the nodules of that material which some layers of the shale contain in abundance. In places these decomposing nodules give a brown hue to several acres of slope, and ant-hills here are of the same color. In the gypsum hills of Barber county, Kansas, we found ant-hills glistening with fragments of selenite.

In short, we find the ants are somewhat like ourselves: they roof their houses with